Image

1745

TRANSMITTAL LETTER (General - Patent Pending)	Docket No. C-2451

In Re Application Of: **Paul R. Margiott; Christopher W. Callahan; Michael L. Perry; and Glenn W. Scheffler**

Serial No.	Filing Date	Examiner	Group Art Unit
09/992,591	11/06/2001		1745

Title: **Shut-down Procedure for Fuel Cell Fuel Processing System**

TO THE COMMISSIONER FOR PATENTS:

Transmitted herewith is:

A Response to First Office Action

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Dated: **February 17, 2004**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE	
In re application of : Margiott et al Serial No.: 09/992,591 Filed: 11/06/2001	Docket No.: C-2451 Examiner: Alejandro, Raymond Group Art Unit: 1745
Title: Shut-down Procedure for Fuel Cell Fuel Processing System	

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Commissioner for Patents
P.O. Box 1450
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Sir:

RESPONSE TO FIRST OFFICE ACTION

In the Office Action dated January 8, 2004, all the claims (1-17) of the subject application are rejected under 35 U.S.C. 103(a) as being unpatentable over Takechi et al in view of Cameron. For the following reasons, Applicants disagree with the basis for the Examiner's rejection and believe all the claims as originally presented are patentable and should be allowed.

The only independent claim in the application is amended claim 1. The invention is a process for shutting down a fuel cell and its associated fuel processing system, wherein the fuel processing system includes "...a fuel reformer in series flow relationship with a catalytic shift converter..." (claim 1, lines 6-8). During normal fuel cell operation "...organic fuel...is directed, in series, through the fuel reformer, the shift converter, and fuel cell anode flow field..." (claim 1, lines 8-12). As set forth in claim 1 at lines 15-19, the steps of the shut-down procedure comprise:

a. disconnecting the load from the cell and halting the flow of organic fuel from the source to the fuel processing system; and then

b. purging the reformer of residual hydrogen by flowing air through the reformer.

Step b. of claim 1 is a novel and unobvious step of the shut down procedure and is not shown or made obvious from any of the art of record.

Claim 3 is dependent upon claim 1 and further requires that the fuel cell anode flow field, as well as the reformer "are purged of residual hydrogen by passing air, in series, through the reformer and thereafter through the fuel cell anode flow field." (emphasis added)

The fuel cell system described in Takechi et al shows a catalytic fuel reformer in series with a fuel cell, wherein, during normal fuel cell operation, the reformed fuel is passed from the reformer into and through the anode side of the fuel cell. Takechi et al, at the bottom of column 3 and the top of column 4, discusses four conditions that must be met in order for there to be a safe shut-down of the system. None of these conditions, however, requires or suggests purging the fuel reformer of residual hydrogen by passing air therethrough, as is required by all of Applicants' claims. More specifically, Takechi et al's condition #4 requires either reducing the temperature of the reformer catalyst bed to deactivate it, or purging the bed with an inert gas. Takechi et al describes using air (introduced by a blower 11) to cool the catalyst bed; but that air simply passes around (i.e. in heat exchange relationship with) the catalyst bed, and does not purge residual hydrogen from the reformer, as required by Applicants' claims.

Takechi et al does describe the use of an air purge or inert gas purge for the cathode side of the cell (column 4, lines 29-34), but not for the anode side as required by Applicants' claim 3, which also requires that the air used to purge the reformer be thereafter passed through the anode side of the cell.

Additionally, the Examiner, on the top of page 5 of the office action, emphasizes that the Takechi et al burners 7m, 7h "are in fluid communication with the fuel cell 2", and that the valve 24 is connected to the fuel cell "allowing the selection of either low temperature atmospheric air or high temperature air from the fuel processor 1." It is not understood how this relates to Applicants' invention. What is actually shown and described in Takechi et al is the use of the residual hydrogen in the fuel cell anode exhaust stream as fuel for the burners 7, and the use of air from the valve 24 as a purge gas for the cathode side of the cell. Note that nothing except hydrogen from the storage tank 16 passes through the anode side of the fuel cell during either fuel cell operation or shut-down.

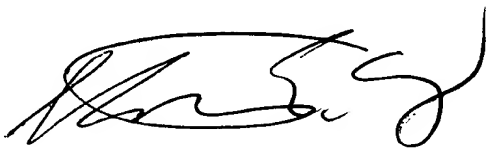
From the foregoing, it is clear that Takechi et al does not suggest an air purge of the residual hydrogen from the reformer or an air purge of the anode flow field. The Examiner appears to recognize this by stating on page 5 of the office action that "...Takechi et al do not expressly disclose the specific purging steps."

Cameron is cited by the Examiner for its teaching of the purging of a fuel cell with either an inert gas or with the products of combustion from a combustor. However, Cameron does not suggest, as part of the shut-down procedure, that residual hydrogen be purged from a reformer using air. Cameron does not even use a reformer to provide fuel for the fuel cell during normal cell operation. The combustor of Cameron, even if it were a reformer, is only used (a) to provide heat for the fuel cell (col. 3, lines 43-47) (or for its circulating electrolyte) or (b) to generate inert combustion products (not air) for purging the fuel cell (col. 3, lines 34-36). The combustor itself is not purged upon shut-down of the cell.

To summarize, the arguments set forth on page 6 of the office action as to how the combination of Takechi et al and Cameron make Applicant's invention obvious are not correct for two basic reasons. First, as set forth above, neither of the cited patents describe or suggest a shut-down procedure that includes an air purge of the residual

hydrogen within a fuel reformer or the air purge of the anode side of the fuel cell. And, second, the steps that the Examiner asserts are made obvious by the combination of Takechi et al and Cameron are not the steps of Applicants' invention. Therefore, Applicants request reexamination of all the claims and allowances thereof.

Respectfully submitted,



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